N080-630 ERIC REPORT RESUME

ED 010 050 10-06-66 24 (REV)

WORD ASSOCIATIONS AND LEARNING TO READ.

SAMUELS, S. JAY
BVE08490 UNIVERSITY OF CALIFORNIA, LOS ANGELES CAMPUS

CRP-S-378
- -66
EDRS PRICE MF-$0.09 HC-$1.44 36P.

*WORD RECOGNITION, *READING ACHIEVEMENT, *READING INSTRUCTION, ORAL COMMUNICATION, LEARNING EXPERIENCES, *PRIMARY GRADES, READING SKILLS, READING SPEED, *WORD ASSOCIATIONS, LOS ANGELES, CALIFORNIA, MINNEAPOLIS, MINNESOTA

AN EXPERIMENT WAS CONDUCTED TO DETERMINE THE EFFECT OF 2-WORD ASSOCIATIONS IN LEARNING TO READ THE SECOND WORD OF A 2-WORD CHAIN. ABOUT 45 FIRST AND SECOND GRADE STUDENTS WERE CHOSEN AS SUBJECTS AFTER PRETESTING TO INSURE THEY WERE ABLE TO READ THE FIRST (STIMULUS) WORD BUT NOT THE SECOND (RESPONSE) WORD OF EACH WORD PAIR USED IN THE STUDY. EIGHT STIMULUS AND EIGHT RESPONSE WORDS WERE USED. EACH TRAINEE FIRST RECEIVED INSTRUCTION IN WORD ASSOCIATION BY RESPONDING ORALLY WITH THE RESPONSE WORD AFTER LEARNING THE STIMULUS WORD. READING TRAINING FOLLOWED THIS FIRST PROCEDURE THROUGH WORD PAIR RECALL AND WORD MATCHING TECHNIQUES. A WORD RECOGNITION TEST WAS THEN GIVEN ON THE EIGHT RESPONSE WORDS. TWO MEASURES OF LEARNING WERE USED--(1) NUMBER OF CORRECT READING RESPONSES, AND (2) SPEED OF RECOGNITION. RESULTS FROM BOTH MEASURES SHOWED CONCLUSIVELY THAT THE STRENGTH OF ASSOCIATIONS BETWEEN WORDS DID INFLUENCE THE OVERALL ACQUISITION OF CORRECT READING RESPONSES. (JH)

ED010050

U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
Office of Education
This document has been reproduced exactly as received from the person or organization originating it. Points of view or opinions stated do not necessarily represent official Office of Education position or policy.

WORD ASSOCIATIONS AND LEARNING TO READ

S. Jay Samuels
University of Minnesota

1966

Cooperative Research Project S-378

The research reported herein was supported by the Cooperative Research Program of the Office of Education, U. S. Department of Health, Education, and Welfare

Contractor

University of California, Los Angeles
Los Angeles, California

PRINCIPAL INVESTIGATORS

Merlin C. Wittrock

S. Jay Samuels

Title: Word Associations and Learning to Read

Investigator: S. Jay Samuels

Institution: University of California, Los Angeles and University of Minnesota

Project Number: S-378

Duration: July 1, 1965 to December 31, 1965

BACKGROUND

When the beginning reader encounters a new word while reading, if he does not know what the appropriate verbal response is for that word, he will exerpience great difficulty in learning to read the word. The importance of the present experiment to the field of education is that it tests a method which can be used to increase the probability that a beginning reader will have available an appropriate verbal response when he visually discriminates a new word while learning to read.

OBJECTIVE

The purpose of the present study was to determine the effect of word associations on learning to read. To be more specific, the purpose of the experiment was to investigate what effect the strength of association between two words would have on learning to read the second word in a two-word chain.

PROCEDURE

Subjects

The subjects were 44 first and second grade students from a Minneapolis public school. All the subjects were pretested to insure they were able to read the first (stimulus) word but not the second (response) word of each word pair used in this study. The subjects were then randomly assigned to one of four rows in the 4 x 4 design.

Design

A 4 x 4 repeated measure Graeco-Latin square design was used in which the order of treatment presentation and the word pairs used with each

treatment were counter-balanced. Each subject received all four treatments in succession, thereby serving as his own control.

In order to determine the effect of word association strength on learning to read the second word in each word pair, the strength of the association between the first (stimulus) and second (response) word was varied for each of the word pairs in the four treatments. Varying the strength of the association between the stimulus and response word in a word pair was accomplished during word association training by varying the number of times the subject said the response word after hearing the stimulus word. The four treatments are A-30, A-10, A-5, and A-0. Thus, for A-30, the subject said the response word 30 times, for A-10, the subject said the response word 10 times, and for A-5, the subject said the response word 5 times. For A-0, which was the control treatment, no word association training was given.

The subjects worked individually with the experimenter. They were first pretested on all the stimulus and response words, and following the pretest, the subjects were given word association training on six pairs of words, then reading training on eight pairs of words, and a final test of word recognition on eight response words.

Pretest

To test the effect of word association strength on learning to read the second word in each word pair, it was essential that the subjects be able to read the first (stimulus) word but not the second (response) word of each pair at the start of the experiment. Therefore, each subject was pretested on the eight stimulus and the eight response words used in reading training.

The eight stimulus words used in the experiment were: big, eat, black, like, red, make, blue, and play. The eight response words used in the experiment were: thumbnail, faerie, chequer, bumblebee, liquorice, dominoes, martial, and muzjik.

All visual stimuli used in this experiment were typed with a primary-style typewriter on 5 x 8 inch index cards.

The pretest consisted of presenting the cards one at a time to the subject for 20 seconds and asking him to read the word typed on the card. If he failed to read any of the stimulus words, or if he was able to read any of the response words, he was eliminated.

Word Association Training

After the pretest, word association training was given. The subject learned six pairs of words in succession.

For treatment A-0, no word association training was given.

For treatment A-5, first the experimenter and then the subject alternately said the word pairs. For example, first the experimenter said, "Black - Music" and then the subject said, "Black - Music." This was done two times. Then the experimenter said, "Black," and the subject responded with "Music." This was done three times. Thus, for treatment A-5, the subject said the response word five times after hearing the stimulus word.

For treatment A-10, first the experimenter and then the subject alternately said the word pairs. For example, the experimenter said, "Big - Thumbnail," and then the subject said, "Big - Thumbnail." This was done three times. Then the experimenter said, "Big," and the subject responded with "Thumbnail." This was done seven times. Thus, for treatment A-10, the subject said the response word ten times after hearing the stimulus word.

For treatment A-30, first the experimenter and then the subject alternately said the word pairs. For example, first the experimenter said, "Red - martial," and then the subject said, "Red - martial." This was done ten times. Then the experimenter said, "Red," and the subject responded with, "martial." This was done twenty times. Thus, for treatment A-30, the subject said the response word 30 times after hearing the stimulus word.

Reading Training

Following word association training, reading training was given with the same word pairs learned during word association training. Reading training was given in two stages. In stage one, each pair of words was presented once. At each presentation, the experimenter read the pair of words at the top of the card. The subject then pointed to the word pairs at the top of the card and read them. Following this, the subject pointed to the multiple choice word pairs at the bottom of the card which matched the word pairs at the top and read them.

After the subject read the eight pairs of words with help from the experimenter, stage two was begun. During this stage, at no time did the experimenter read any words for the subject. During stage two, three different kinds of reading-training cards were presented to the subject in sequence. The subject was instructed to point to the words at the top of the card and read them, then to select the matching words at the bottom of the card and read them.

For each word pair, six cards were used so that if the subject was able to read the words, he went from emitting oral responses for the

stimulus and response words to emitting an oral response for the response word alone.

Word Recognition Tests

Immediately following reading training, a word recognition test was given on the eight response words. Two measures of learning were used--number of correct reading responses, and speed of recognition. The test for each treatment was 40 seconds long. Each test consisted of two words, presented one at a time for 20 seconds.

RESULTS

Number of Correct Reading Responses

The analysis of variance on repeated measure Graeco-Latin squares for number of correct reading responses given on the word recognition tests disclosed that neither the different rows to which subjects were assigned nor the different orders of treatment presentation were significant. The main treatment effect of word association strength on learning reading responses was significant ($F = 14.98$, $df = 3/120$, $p < .001$). The analysis also disclosed that certain word pairs were learned more readily that others ($F = 3.68$, $df = 3/120$, $p < .05$).

The means for number of correct reading responses for treatments given on the word recognition tests were .89 for treatment A-0, 1.39 for treatment A-5, 1.61 for treatment A-10, and 1.66 for treatment A-30.

The Newman-Keuls tests were used to determine which pairs of treatment means were significantly different from each other. The Newman-Keuls tests on pairs of treatment means reveal that significantly

more correct reading responses were given on the word recognition tests with treatments A-5, A-10, and A-30 than with A-0 ($p < .01$), but A-5, A-10, and A-30 were not significantly different from each other.

Speed of Recognition

The analysis of variance on the repeated measure Graeco-Latin squares for speed of word recognition for word recognition disclosed that neither the different rows to which subjects were assigned nor the different orders of treatment presentation were significant. The main treatment effect of word association strength on speed of recognition was significant ($F = 13.01$, $df = 3/120$, $p < .001$). The analysis also disclosed that speed of recognition was faster for certain word pairs ($F = 6.04$, $df = 3/120$, $p < .001$).

The mean recognition speeds for treatments on the two-word tests, in which each subject was given twenty seconds to respond to each word on the test, was 25.45 seconds for treatment A-0, 18.61 seconds for A-5, 14.95 seconds for A-10, and 12.93 seconds for A-30.

The Newman-Keuls tests on pairs of treatment means for speed of word recognition show that recognition speed for treatments A-30, A-10, and A-5 were all significantly faster than for treatment A-0 ($p < .01$). Speed of recognition was faster for A-30 than for A-5 ($p < .05$). None of the other comparisons were significant.

CONCLUSIONS

The specific question asked in this investigation was: what effect does word association strength have on the acquisition of reading responses? Response acquisition was measured in two ways--the number

of correct reading responses given on the word recognition tests and the speed of word recognition. The results lead one to conclude that the strength of the associations between words does influence the acquisition of reading responses.

Word association strength influences learning to read. Dependably more correct reading responses were given in all word association treatments than was given in the control treatment receiving no word association training. With regard to speed of word recognition, the results were highly similar to those for number of correct reading responses. Recognition speed was significantly faster for all word association treatments than for the control treatment.

Although significantly more correct reading responses occurred in all experimental treatments receiving word association training than for the control treatment, significant differences among the three experimental treatments in mean number of correct reading responses given on the word recognition tests were not found, even though each of the three experimental treatments was designed to produce word associations differing in degree of word association strength.

With one exception, similar results were found with regard to speed of word recognition. Although recognition speed for all experimental treatments were significantly faster than for the control treatment, differences in recognition speed among the experimental treatments were not significantly different from each other. The one exception was the comparison between experimental treatments A-5 and A-30, where it was found that recognition speed was significantly faster for A-30 than for A-5.

An unexpected finding was that there were no significant differences in number of correct reading responses among the three experimental treatments even though increasing amounts of word association training were given to some of the experimental treatments. One possible explanation for this finding is that a minimal amount of word association strength may be sufficient to have the subject emit the appropriate verbal response. Additional amounts of word association strength beyond this minimum may be superfluous.

Significant differences in reading acquisition were not associated with increasing amounts of word association training. Even minimal amounts of word association training were sufficient to produce significant increases in reading attainment. The implications of this last finding for the teaching of beginning reading are important, especially with regard to the need for familiarizing students with the oral content of the reading material before actual reading instruction is given. For example, in teaching children to read from experience charts, it seems advisable to give the students word association training; e.g., by having them repeat the content of the chart word-for-word several times to familiarize them with the sequence of the words. After the familiarization training, formal reading training should then be instituted. While many teachers of reading are already aware of the importance of familiarizing students with the contents of the reading chart, few of them follow the practice of having the students repeat verbatim what is on the chart before trying to teach the child to read the words on the chart. The results of this study would lead one to believe that the

recommendations stated herein would facilitate reading acquisition and would require but a slight modification in the procedures which teachers have used in reading instruction.

BIBLIOGRAPHY

There are twenty references listed in the final report.

PUBLICATIONS

No publications have resulted from this study at present, but journal publication is planned.

TABLE OF CONTENTS

	PAGE
PREFACE	V
THE PROBLEM	1
RELATED RESEARCH	3
METHOD AND MATERIALS	8
RESULTS	15
DISCUSSION	28
REFERENCES	31

LIST OF TABLES

TABLE		PAGE
1	Four x Four Graeco-Latin Square Design Showing the Word Pairs and the Number of Times the Subject Says the Word Pairs During Word Association Training	9
2	Paradigm to Illustrate Row One of Experimental Design. . .	11
3	Analysis of Variance for Repeated Measure Graeco-Latin Squares for Number of Correct Reading Responses.	16
4	Mean Number of Correct Reading Responses and Standard Deviations for Treatments on the Word Recognition Tests. .	17
5	Newman-Keuls Tests on Means for Number of Correct Reading Responses for Treatments	18
6	Mean Number of Correct Responses and Standard Deviations for Word Pairs on the Word Recognition Tests	19
7	Newman-Keuls Tests on Means for Number of Correct Reading Responses for Word Pairs	21
8	Analysis of Variance for Reapeated Measure Graeco-Latin Squares for Speed of Word Recognition.	22
9	Means and Standard Deviations in Seconds for Speed of Word Recognition for Treatments.	23
10	Newman-Keuls Tests on Means for Speed of Word Recognition for Treatments	24
11	Means and Standard Deviations in Seconds for Speed of Word Recognition for Word Pairs.	26
12	Newman-Keuls Tests on Means for Speed of Word Recognition for Word Pairs	27

LIST OF FIGURES

FIGURE		PAGE
1	Examples of Three Kinds of Cards Used in Reading Training. .	13

PREFACE

This report was made possible through the cooperation and support of many individuals. Thanks are due to Mr. Edwin Myers who collected and analyzed the data. He contributed significantly to numerous aspects of the investigation, and his devotion to this study is gratefully acknowledged. Appreciation is also extended to Professor Roger E. Wilk, Chairman of the Department of Educational Psychology at the University of Minnesota, Mr. Almon G. Hoy, Principal of the University of Minnesota High School, and Dr. Robert Rainey, Consultant in Educational Research for the Minneapolis schools, for their help in locating a school in which to conduct the study. Without the help of Mr. Ingwal Ostreim, Principal at Waite Park School, the teachers, and the children, this study would not have been possible.

With deep gratitude we also wish to acknowledge the U. S. Department of Health, Education, and Welfare Office of Education for their financial support of the study, "Word Associations and Learning to Read."

THE PROBLEM

Learning to read a word is a complex process requiring three steps. The letter stimuli must be visually discriminated, the appropriate verbal response must be available, and the letter stimuli and the verbal response must be associated or hooked-up so that the presentation of the letter stimuli will evoke the correct verbal response.

When the beginning reader encounters a new word while reading, if he does not know what the appropriate verbal response is for that word, he will experience great difficulty in learning to read the word. Therefore, one of the ways in which it is possible to help the beginning reader learn to read is to increase the probability that he will have available the correct verbal response when he visually discriminates a new word while reading.

Several procedures have been recommended by educators and psychologists to increase the probability that the beginning reader will have available the correct verbal response when he encounters a new word. In order to increase the probability that the correct verbal response will be available, Dolch (1960) and Gans (1963) recommended the use of experience charts, Lefevre (1964) and Strickland (1962) recommend using syntactical patterns in primer text which would reflect the child's speaking patterns, while Staats (1963) recommends that primer text be written which incorporates word associates from word association norms. Thus, according to Staats, as the child reads the words which are associated, each reading response would act as a stimulus which would tend to elicit the next verbal response. For example, if the word association norms indicated there was a strong

play-ball association, and if the children had already been taught to read the sentence: "I like to play," the next word that should be introduced is the word "ball" in the sentence: "I like to play ball." When the child reads, "I like to play," the words would act as a stimulus to elicit the next response, "ball."

While at the present time there is empirical evidence that word associations influence the learning of reading responses (Samuels, 1966A), there is no information on the effect of word association strength on the acquisition of reading responses. The purpose of the present study, therefore, is to determine the effect of word associations on learning to read. To be more specific, the purpose of the experiment is to investigate what effect the strength of association between two words would have on learning to read the second word in a two-word chain. All the subjects in the experiment were able to read the first word in the two-word chain whereas none were able to read the second word at the onset of the experiment.

RELATED RESEARCH

If one assumes that when verbal material has been memorized, associations are formed between the words in the connected discourse, then the use of word associations in the teaching of reading has a history which may be traced back to pedagogical practices used by teachers in early American schools. It was common practice in early American schools to have the beginning reader learn to read from passages which he had memorized previously at home. These memorized passages often consisted of prayers and verses from the Bible or other religious tracts. By having the child learn to read words in connected discourse which had been memorized previously at home, the child always had available the appropriate verbal response for the printed word stimuli he was visually discriminating, unless, of course, he lost his place while reading.

Littlefield (1904) describes how reading was taught in early American schools using the catechism as the reading text. As part of the religious training received at home, long passages from the catechism were memorized by the child. Later at school reading was taught by having the child read from the catechism. The Horn Book (Meyer, 1957) and the New England Primer (Ford, 1899), two other sources from which beginning reading was taught, introduced reading through the use of prayers and verses already familiar to the children. Still another popular book used in beginning reading instruction was the Bible. Small (1914) reports that one method used to teach reading, using the Bible as the text, was to have skilled readers repetitiously read the same passages out loud until the beginning reader had also learned to read the words in the passage.

Other methods of reading instruction, in which the student is orally familiarized with the word order or sentence structure of the reading text before reading instruction is given, are reported by Farnham (1881) and Stemmler (1966). Disillusioned with the reading methods in use in the late 1800's which led to word-calling with little comprehension, Farnham developed a method of reading instruction which attempted to teach reading in such a way that comprehension would be a concommitant of the reading acquisition process. To accomplish this, the instructional process had two stages. During stage one, the oral familiarization stage, the teacher would hold up a pencil and say, "I have a pencil." The children took turns telling what they had, saying such things as, "I have a book," or "I have a pen." Following oral familiarization, stage two, or reading training, was begun. The students learned to read sentences starting with, "I have a _____." The same words used by the children in their oral exercises were used to fill the noun slot. A somewhat similar method to the one used by Farnham has been used by Stemmler to familiarize Mexican-American children with the syntactical patterns of spoken English.

The children were given instruction on topics such as learning names for geometric shapes. During the instruction they learned syntactical patterns of English by reciting sentences such as, "This is a triangle." Subsequently, reading instruction was introduced in which the same syntactical patterns used in oral familiarization were used in reading training.

Recently, Keislar, McNeil, and Strandberg (1966) have developed a "talking book." The "talking book" is capable of teaching reading by providing auditory verbal responses to the student while he visually discriminates the printed words on the page.

Whereas Keislar, McNeil, and Strandberg (1966) have developed a system whereby correct auditory responses are provided the learner, other researchers have investigated what happens during the reading acquisition process when both correct and incorrect responses are provided. To determine what effect different kinds of word associations would have on learning reading responses, Samuels (1966A) had first graders experimentally learn word associations by having them memorize pairs of words. The subjects then received reading training on either the same or different pairs of words than they had learned to associate during word association training. Samuels found that reading acquisition was superior when the same word pairs were used for association and reading training. The superiority in reading acquisition for the treatment in which the same word pairs were used for association and reading training resulted from the fact that correct verbal responses were available to the subject while he visually discriminated the word he had to learn to read. When he tried to learn to read words which were non-associates in the treatment in which different word pairs were used for word association and reading training, the correct verbal responses were not available.

Although not directly concerned with learning how to read, a number of relevant studies have been reported on linguistic and psychological variables which influence word recognition, reading rate, reading comprehension, and the recognition of flashed words.

Goodman (1965) has investigated the effect of linguistic cues on word recognition. He found that in grade one, three times as many words were missed when presented alone than when they were presented in the

context of a story. The explanation for this finding may be that when reading words in isolation, fewer cues are available to help the student read the word than when the same words appear in a meaningful context.

A somewhat similar experiment has been reported by Samuels (1966B). In this study, two groups of subjects read either one of two one-hundred and-fifty word passages of meaningful text (developed by Rosenberg, 1965). The passages were identical for variables such as number of words, word frequency, syntactical pattern, and meaning. The passages differed in that one passage contained high strength word associations whereas the other contained low strength associations. Reading speed and recall were significantly better for the high word association strength passage than for the low word association strength passage for college and elementary school subjects.

Another study on factors which influence reading efficiency has been reported by Morton (1964). He hypothesized that reading speed and regressions are related to knowledge of the statistical properties of language. To the extent that the reader can utilize cues while reading, to that extent can he increase his speed and reduce the number of regressions. Morton had subjects read aloud two-hundred word passages of statistical approximations of English up to the eighth order. The general hypothesis was supported in that he found speed progressively increased up to the fifth order and the number of regressions decreased to the fourth order of approximation to meaningful text.

The final studies to be reported investigated the effect of word associations on speed of word recognition. O'Neil (1953) and Rouse and

Vernis (1963) demonstrated that when word associations are tachistoscopically exposed in succession, recognizing the first word aids in recognizing the second word, and the stronger the association between the words, the lower the recognition threshhold.

In summary, of the studies reported herein, one should note that to the extent that the reader can be prompted with the correct verbal response, and to the extent that he can utilize previously memorized material, syntactical patterns, linguistic cues, and word associations so as to make available the correct response, to that extent is the acquisition of reading responses, reading speed, and word recognition facilitated.

METHOD AND MATERIALS

Subjects

Forty-four first and second grade subjects from a Minneapolis public school were used in the study. All the subjects were pretested to insure they were able to read the first but not the second word of each word pair used in the study. The forty-four subjects were randomly assigned to one of four rows in the four x four design.

Design

A four x four repeated measure Graeco-Latin square design was used in which the order of treatment presentation and the word pairs used with each treatment were counterbalanced. Each subject received all four treatments in succession, thereby serving as his own control.

In order to determine the effect of word association strength on learning to read the second word in each word pair, the strength of the association between the first (stimulus) and second (response) word was varied for each of the word pairs in the four treatments. Varying the strength of the association between the stimulus and the response word in a word pair was accomplished during word association training by varying the number of times the subject said the response word after hearing the stimulus word. As seen in Table 1, the four treatments are A-30, A-10, A-5, and A-0. Thus, for A-30, the subject said the response word thirty times, for A-10, the subject said the response word ten times, and for A-5, the subject said the response word five times. For A-0, no word association training was given.

Table 1: FOUR X FOUR GRAECO-LATIN SQUARE DESIGN SHOWING THE WORD PAIRS AND THE NUMBER OF TIMES THE SUBJECT SAYS THE WORD PAIRS DURING WORD ASSOCIATION TRAINING.*

Order of Treatment Presentation and Word Pairs							
(A-0)	β	(A-10)	δ	(A-5)	ε	(A-30)	γ
(A-30)	ε	(A-5)	γ	(A-10)	β	(A-0)	δ
(A-5)	δ	(A-30)	β	(A-0)	γ	(A-10)	ε
(A-10)	γ	(A-0)	ε	(A-30)	δ	(A-5)	β

* Reading from left to right along rows, the order to treatment presentation and the word pairs used with each treatment are indicated. The number next to letter "A" indicates the number of times the subject says the word pairs during word association training for each treatment. The Greek letter indicates the word pairs. The same word pairs are used for word association and reading training. Word pairs are visually presented only during reading training.

Greek Letter	Word Pairs
ε	black-muzjik like-liquorice
β	blue-dominoes play-faerie
γ	red-martial make-chequer
δ	big-thumbnail eat-bumblebee

The subjects worked individually with the experimenter. They were first pretested on all the stimulus and response words, and, as seen in Table 2, following the pretest, the subjects were given word association training on six pairs of words, then reading training on eight pairs of words, and a final test of word recognition on eight response words.

Procedure

Pretest.--To test the effect of word association strength on learning to read the second word in each word pair, it was essential that the subjects be able to read the first (stimulus) word but not the second (response) word of each pair at the start of the experiment. Therefore, each subject was pretested on the eight stimulus and the eight response words used in reading training. The stimulus and response words used in the experiment are shown in Table 1.

All visual stimuli used in this experiment were typed with a primary-style typewriter on five x eight inch index cards.

The pretest consisted of presenting the cards one at a time to the subject for twenty seconds and asking him to read the word typed on the card. If he failed to read any of the stimulus words, or if he was able to read any of the response words, he was eliminated.

Word Association Training.--After the pretest, word association training was given. As seen in Table 2, the subject learned six pairs of words in succession.

For treatment A-0, no word association training was given.

For treatment A-10, first the experimenter and then the subject alternately said the word pairs. For example, the experimenter said,

Table 2: PARADIGM TO ILLUSTRATE ROW ONE OF EXPERIMENTAL DESIGN

Number of Times S Says Word Pairs During Word Association Training		Reading Training	Word Recognition Test Order
none none	> 0	blue-dominoes play-faerie	R_3 thumbnail R_2 faerie
big-thumbnail eat-bumblebee	> 10	big-thumbnail eat-bumblebee	R_8 chequer R_4 bumblebee
black-music like-liquorice	> 5	black-muzjik like-liquorice	R_6 liquorice R_1 dominoes
red-martial make-checker	> 30	red-martial make-chequer	R_7 martial R_5 muzjik

"big-thumbnail," and then the subject said, "big thumbnail." This was done three times. Then the experimenter said, "big," and the subject responded with "thumbnail." This was done seven times. Thus, for treatment A-10, the subject said the response word ten times after hearing the stimulus word.

For treatment A-5, first the experimenter and then the subject alternately said the word pairs. For example, first the experimenter said, "black-music," and then the subject said, "black-music." This was done two times. Then the experimenter said, "black," and the subject responded with "music." This was done three times. Thus, for treatment A-5, the subject said the response word five times after hearing the stimulus word.

For treatment A-30, first the experimenter and then the subject alternately said the word pairs. For example, first the experimenter said, "red-martial," and then the subject said, "red-martial." This was done ten times. Then the experimenter said, "red," and the subject responded with, "martial." This was done twenty times. Thus, for treatment A-30, the subject said the response word thirty times after hearing the stimulus word.

Reading Training.--Following word association training, reading training was given with the same word pairs learned during word association training. Reading training was given in two stages. In Stage 1, each pair of words was presented once, on a card similar to Figure 1A. At each presentation the experimenter read the pair of words at the top of the card. The subject then pointed to the word pairs at the top and read

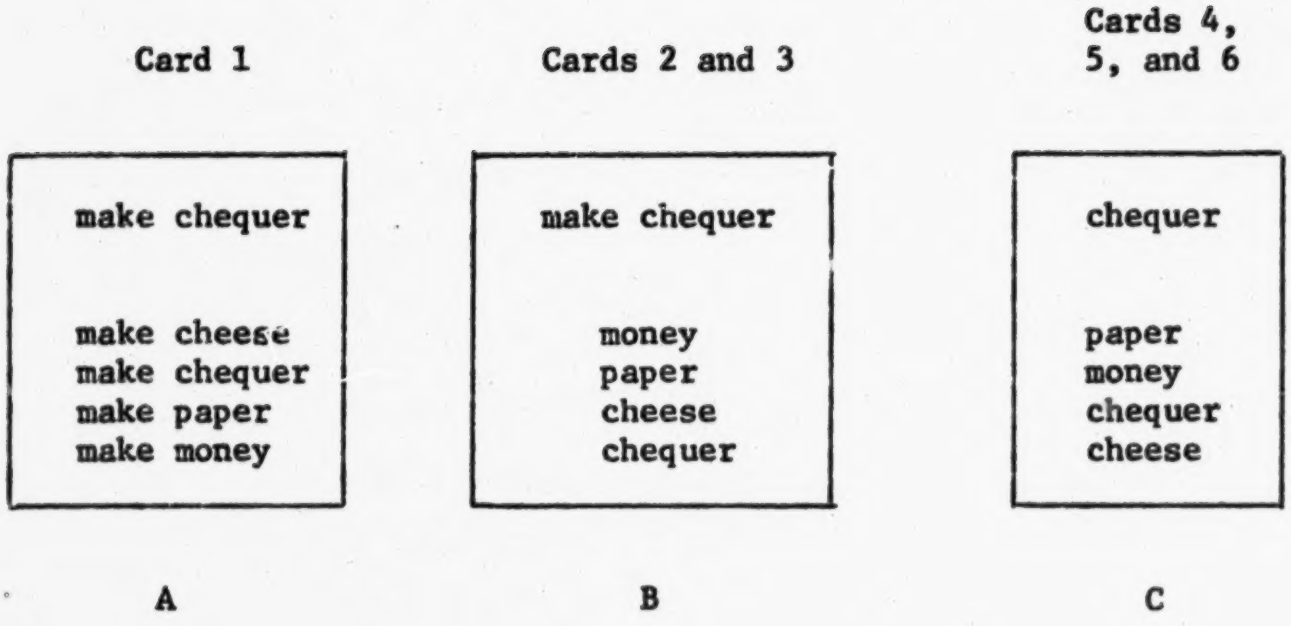

Figure 1. Examples of three kinds of cards used in reading training.

them. Following this, the subject pointed to the multiple choice word pairs at the bottom of the card which matched the word pairs at the top and read them.

After the subject read the eight pairs of words with help from the experimenter, Stage 2 was begun. During this stage, at no time did the experimenter read any words for the subject. As seen in Figure 1, Parts A, B, and C, three different kinds of reading-training cards were presented in sequence. The subject was instructed to point to the words at the top of the card and read them, then to select the matching words at the bottom and read them.

For each word pair, six cards were used so that if the subject was able to read the words, he went from emitting oral responses for the stimulus and response words to emitting an oral response for the response word alone.

Word Recognition Test.--Immediately following reading training a word recognition test was given on the eight response words. Two measures of learning were used--number of correct reading responses, and speed of recognition. The test for each treatment was forty seconds long. Each test consisted of two words, presented one at a time for twenty seconds.

RESULTS

Number of Correct Reading Responses

The analysis of variance on repeated measure Graeco-Latin squares for number of correct reading responses given on the word recognition tests disclosed that neither the different rows to which subjects were assigned nor the different orders of treatment presentation were significant (See Table 3). The main treatment effect of word association strength on learning reading responses was significant ($F = 14.98$, $df = 3/120$, $p < .001$). The analysis also disclosed that certain word pairs were learned more readily than others ($F = 3.68$, $df = 3/120$, $p < .05$).

As seen in Table 4, the means for number of correct reading responses for treatments given on the word recognition tests were .89 for treatment A-0, 1.39 for treatment A-5, 1.61 for treatment A-10, and 1.66 for treatment A-30.

The Newman-Keuls tests (Winer, 1962) were used to determine which pairs of treatment means were significantly different from each other. As seen in Table 5, the Newman-Keuls tests on pairs of treatment means reveal that significantly more correct reading responses were given on the word recognition tests with treatments A-5, A-10, and A-30 than with A-0 ($p < .01$), but A-5, A-10, and A-30 were not significantly different from each other.

Table 6 indicates that the mean number of correct reading responses for word pairs on the word recognition tests were 1.16 for the word

Table 3: ANALYSIS OF VARIANCE FOR REPEATED MEASURE GRAECO-LATIN SQUARES FOR NUMBER OF CORRECT READING RESPONSES

Source	df	SS	MS	F
Between S's	43	36.23	.23	< 1
Rows (D)	3	.68		
S's Within Rows	40	35.55	.89	
Within S's	132	65.50		
A (Treatments)	3	16.55	5.50	14.98***
P (Order)	3	.50	.13	< 1
C (Word-Pairs)	3	4.05	1.35	3.68*
Residual	3	.31	.10	< 1
Error Within	120	44.09	.37	

*** $P < .001$

* $P < .05$

Table 4: MEAN NUMBER OF CORRECT READING RESPONSES AND STANDARD DEVIATIONS FOR TREATMENTS ON THE WORD RECOGNITION TESTS

	Treatment			
	A-0	A-5	A-10	A-30
M	.89	1.39	1.61	1.66
SD	.84	.75	.54	.65

Table 5: NEWMAN-KEULS TESTS ON MEANS FOR NUMBER OF CORRECT READING RESPONSES FOR TREATMENTS

Treatments		A-0	A-5	A-10	A-30
Ordered Means		.89	1.39	1.61	1.66
Difference Between Pairs	A-0		.50	.72	.77
	A-5			.22	.27
	A-10				.05

	A-0	A-5	A-10	A-30
A-0		**	**	**
A-5			NS	NS
A-10				NS

** ($P < .01$)

Table 6: MEAN NUMBER OF CORRECT RESPONSES AND STANDARD DEVIATIONS FOR WORD PAIRS ON THE WORD RECOGNITION TESTS

	Word Pairs			
	V	ɗ	ẟ	B
M	1.16	1.34	1.50	1.55
SD	.86	.77	.70	.73

pairs designated as √, 1.34 for the word pairs designated as £, 1.50 for the word pairs designated as δ, and 1.55 for the word pairs designated as B.

On the Newman-Keuls tests (See Table 7) on number of correct reading responses for word pairs, one may see that word pairs designated as and 8 were both superior to ($p < .05$) for number of correct reading responses given on the word recognition tests. None of the other comparisons between word pairs were significant.

Speed of Recognition

The analysis of variance on repeated measure Graeco-Latin squares for speed of word recognition on the word recognition tests diclosed that neither the different rows to which subjects were assigned nor the different orders of treatment presentation were significant (See Table 8). The main treatment effect of word association strength on speed of recognition was significant ($F = 13.01$, $df = 3/120$, $p < .001$). The analysis also disclosed that speed of recognition was faster for certain word pairs ($F = 6.04$, $df = 3/120$, $p < .001$).

As seen in Table 9, the mean recognition speeds for treatments on the two-word tests, in which each subject was given twenty seconds to respond to each word on the test, was 25.45 seconds for treatment A-0, 18.61 seconds for A-5, 14.95 seconds for A-10, and 12.93 seconds for A-30.

As seen in Table 10, the Newman-Keuls tests on pairs of treatment means for speed of word recognition show that recognition speed for treatments A-30, A-10, and A-5 were all significantly faster than for

Table 7: NEWMAN-KEULS TESTS ON MEANS FOR NUMBER OF CORRECT READING RESPONSES FOR WORD PAIRS

Word Pairs		ν	α	δ	β
Ordered Pairs		1.16	1.34	1.50	1.55
Difference Between Pairs	ν		.18	.34	.39
	α			.16	.21
	δ				.05

	ν	α	δ	β
ν		NS	*	*
α			NS	NS
δ				NS

* ($P < .05$)

Table 8: ANALYSIS OF VARIANCE FOR REPEATED MEASURE GRAECO-LATIN SQUARES FOR SPEED OF WORD RECOGNITION

Source	df	SS	MS	F
Between S's	43	17066.98		
Rows (D)	3	512.75	170.92	< 1
S's Within Rows	40	16554.23	413.86	
Within S's	132	18911.00		
A (Treatments)	3	3999.93	1333.51	13.01***
B (Order)	3	297.66	99.22	< 1
C (Word Pairs)	3	1855.89	618.63	6.01***
Residual	3	463.93	154.64	1.51
Error Within	120	12293.59	102.45	

*** P < .001

Table 9: MEANS AND STANDARD DEVIATIONS IN SECONDS FOR SPEED OF WORD RECOGNITION FOR TREATMENTS

	Treatment[a]			
	A-0	A-5	A-10	A-30
M	25.45	18.61	14.95	12.93
SD	22.27	14.52	12.65	12.45

[a] Each word was exposed for 20 seconds on the two-word test.

Table 10: NEWMAN-KEULS TESTS ON MEANS FOR SPEED OF WORD RECOGNITION FOR TREATMENTS

Treatments		A-30	A-10	A-5	A-0
Ordered Means		12.93	14.95	18.16	25.45
Difference Between Pairs	A-30		2.02	5.23	12.52
	A-10			3.21	10.50
	A-5				7.29

	A-30	A-10	A-5	A-0
A-30		NS	*	**
A-10			NS	**
A-5				**

* ($P < .05$)

** ($P < .01$)

treatment A-0 ($p < .01$). Speed of recognition was faster for A-30 than for A-5 ($p < .05$). None of the other comparisons were significant.

Table 11 shows that mean speeds of word recognition for word pairs. The mean speed of recognition for the word pairs designated as γ 23.20 seconds, for the word pairs designated as α it was 17.52 seconds, for the word pairs designated as δ it was 16.93 seconds, and for the word pairs designated as β it was 14.29 seconds.

The Newman-Keuls tests for speed of word recognition for word pairs (See Table 12) indicates that speed of recognition was significantly faster for the word pairs designated as β than for the word pairs designated as γ ($p < .01$), faster for δ than for γ ($p < .05$), and faster for α than for γ ($p < .05$). None of the other comparisons were significant.

Table 11: MEANS AND STANDARD DEVIATIONS IN SECONDS FOR SPEED OF WORD RECOGNITION FOR WORD PAIRS

	Word Pairs			
	ν	ℓ	δ	ℓ
M	23.20	17.52	16.93	14.29
SD	15.07	15.85	13.05	13.82

Table 12: NEWMAN-KEULS TESTS ON MEANS FOR SPEED OF WORD RECOGNITION FOR WORD PAIRS

Word Pairs	β	δ	ε	ν
Ordered Means	14.29	16.93	17.52	23.20
Difference Between Pairs β		2.64	3.23	8.91
δ			.59	6.27
ε				5.68

	β	δ	ε	ν
β		NS	NS	**
δ			NS	*
ε				*

** ($P < .01$)

* ($P < .05$)

DISCUSSION

The specific question asked in this investigation was: What effect does word association strength have on the acquisition of reading responses. Response acquisition was measured in two ways--the number of correct reading responses given on the word recognition tests and speed of word recognition. In answer to the specific question raised in this investigation, the results lead one to conclude that the strength of the associations between words does influence the acquisition of reading responses.

Support for the conclusion that word association strength influences learning to read may be found in the data in that dependably more correct reading responses were given for all treatments in which word association training was given than for the control treatment in which no word association training was given. With regard to speed of word recognition, the results were highly similar with those found for number of correct reading responses in that recognition speed was significantly faster for all treatments in which word association training was given than for the control treatment in which no word association training was given.

Although significantly more correct reading responses were given with all experimental treatments receiving word association training than for the control treatment, significant differences among the three experimental treatments in mean number of correct reading responses given on the word recognition tests were not found, even though each of the three experimental treatments was designed to produce word associations differing in degree of word association strength.

With one exception similar results were found with regard to speed of word recognition. Although recognition speed for all experimental treatments were significantly faster than for the control treatment, differences in recognition speed among the experimental treatments were not significantly different from each other. The one exception was the comparison between experimental treatments A-5 and A-30, where it was found that recognition speed was significantly faster for A-30 than for A-5.

An unexpected finding emerging from this study was that there were no significant differences in number of correct reading responses among the three experimental treatments even though increasing amounts of word association training was given with some of the experimental treatments. One possible explanation for this finding is that a minimal amount of word association strength may be all that is necessary to get the subject to emit the appropriate verbal response, and additional amounts of word association strength beyond this minimum is unnecessary.

The finding that significant differences in reading acquisition were not associated with increasing amounts of word association training should not be viewed negatively, especially when one realizes that even minimal amounts of word association training were sufficient to produce significant increases in reading attainment. The implications of this last finding for the teaching of beginning reading are important, especially with regard to the need for orally familiarizing students with the content of the reading material before actual reading instruction is given. For example, in teaching children to read from experience charts, it would

seem advisable to give the students word association training by having them repeat the content of the chart word-for-word several times to familiarize them with the sequence of the words. After the familiarization training, formal reading training should then be instituted. While many teachers of reading are already aware of the importance of familiarizing students with the contents of the reading chart, few of them follow the practice of having the students repeat verbatim what is on the chart before trying to teach the child to read the words on the chart. The results of this study would lead one to believe that the recommendations stated herein would facilitate reading acquisition and would require but a slight modification in the procedures which teachers have used in reading instruction.

REFERENCES

Dolch, E. W. Teaching primary reading. Champaign: The Garrard Press, 1960.

Farnham, G. L. The sentence method of teaching reading, writing, and spelling, a manual for teachers. New York: C. W. Bardeen, 1881.

Ford, P. L. The New England primer. New York: Dodd, Mead and Company, 1899.

Gars, R. Common sense in teaching reading. Indianapolis: Bobbs-Merrill, 1963.

Goodman, K. S. A linguistic study of cues and miscues in reading, Elementary English, 1965, 42, 639-643.

Keislar, E. R., McNeil, J. D., and Strandberg, J. E. Experimentation in teaching young children to read using a talking book system. University of California at Los Angeles, 1966.

Lefevre, C. A. Linguistics and the teaching of reading. New York: McGraw-Hill Book Company, 1964.

Littlefield, G. E. Early schools and schoolbooks of New England. Boston: The Club of Odd Volumes, 1904.

Meyer, A. E. An educational history of the American people. New York: McGraw-Hill Book Company, 1957.

Morton, J. The effect of context upon speed of reading, eye movements and eye voice span. Quarterly Journal of Experimental Psychology. 1964, 16, 340-354.

O'Neil, W. M. The effect of verbal association on Tachistosopic recognition. Australian Journal of Psychology, 1953, 49, 333-338.

Rosenberg, S. Associative factors in the recall of connected discourse. In Progress Report MH 08904-01, 02, Linguistic structure as a variable in verbal learning, 1965.

Rouse, R. O., and Vernis, S. J. The effect of associative connections on the recognition of flashed words. Journal of Verbal Learning and Verbal Behavior, 1963, 1, 300-303.

Samuels, S. J. The effect of experimentally learned word associations on the acquisition of reading responses. The Journal of Educational Psychology, In Press, 1966A.

Samuels, S. J. The effect of word associations on reading speed and recall. Proceedings of the 74th Annual Convention of the American Psychological Association. In Press, 1966B.

Small, W. H. Early New England schools. Boston: Ginn and Company, 1914.

Staats, A. W., and Staats, C. K. Complex human behavior: A systematic extension of learning principles. New York: Holt, Rinehart, Winston, 1963.

Stemmler, A. O. Teaching oral language and reading. Harvard Educational Review, 1960, 36, 42-59.

Strickland, R. G. The language of elementary school children: its relationship to the language of reading textbooks and the quality of reading of selected children. Bulletin of the School of Education, Vol. 38, Bloomington: Indiana University, July 1962.

Winer, B. J. Statistical principles in experimental design. New York: McGraw-Hill Book Company, 1962.